

# Oxygen Absorption in Hemoglobin and Brain Activity Measurement Quantitation of Oxygen Concentration

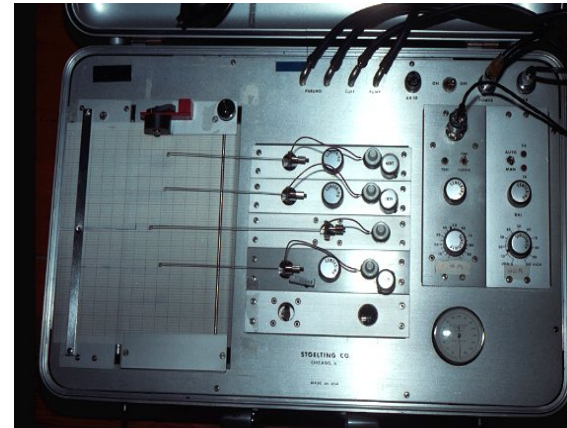
Shakera Guess

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# Motivation

- Current methods of lie detection
  - Polygraph
    - Breathing rate, pulse, blood pressure, perspiration
    - Anxiety Detector



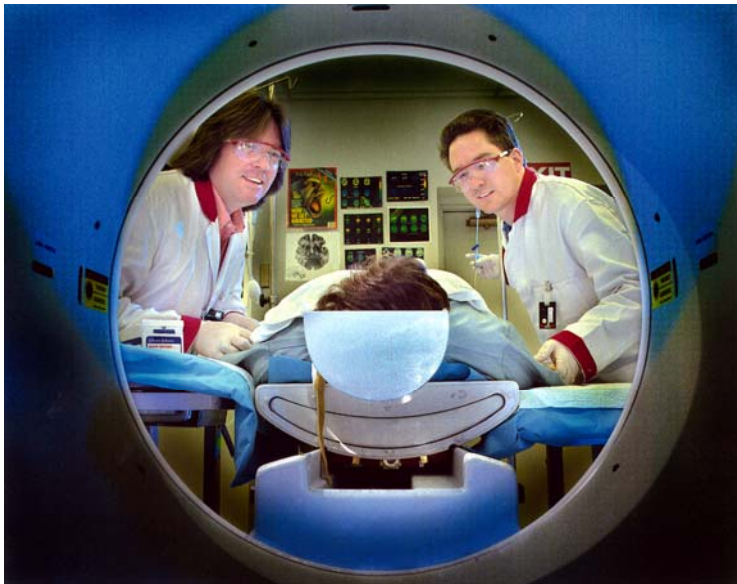
# Motivation

- Current methods of lie detection
  - fMRI
    - Brain mapping
    - Currently most favorable
    - Immobilization
    - Expensive



# Motivation

- A need for non-invasively measuring cognitive function

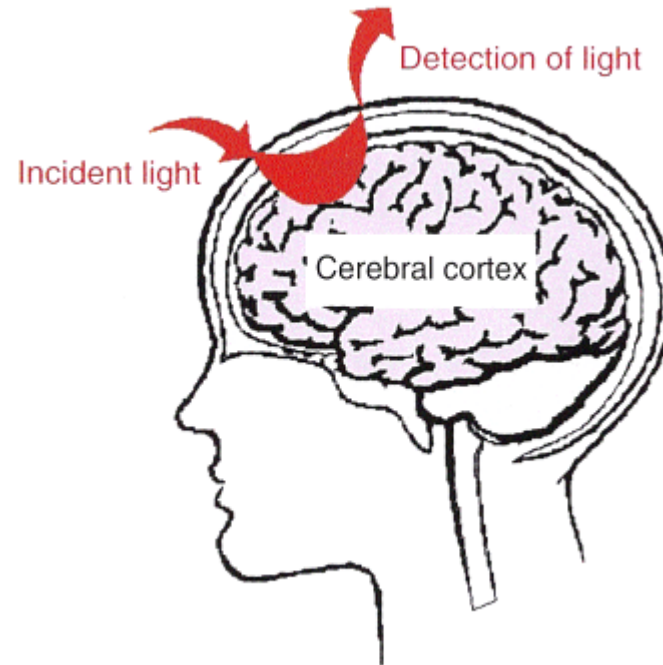


Current methods of measuring brain function include positron emission tomography (PET imaging) and electroencephalography (EEG).

# Background

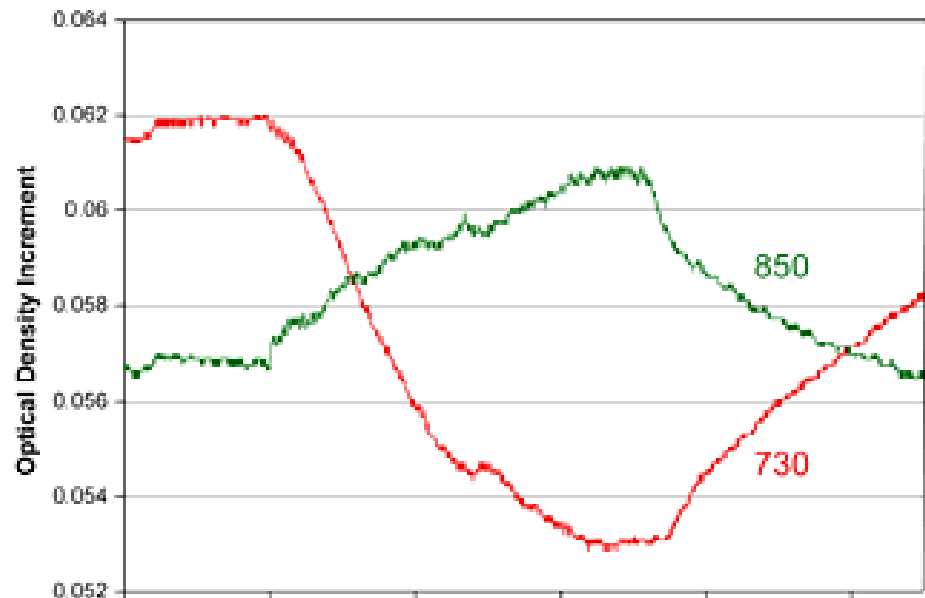
- Near Infrared Spectroscopy (NIRS)
- Many benefits
- Used in a variety of procedures
- 700-900 nm

$$I = GI_0 e^{-(\alpha_{Hb}C_{Hb} + \alpha_{HbO_2}C_{HbO_2})L}$$



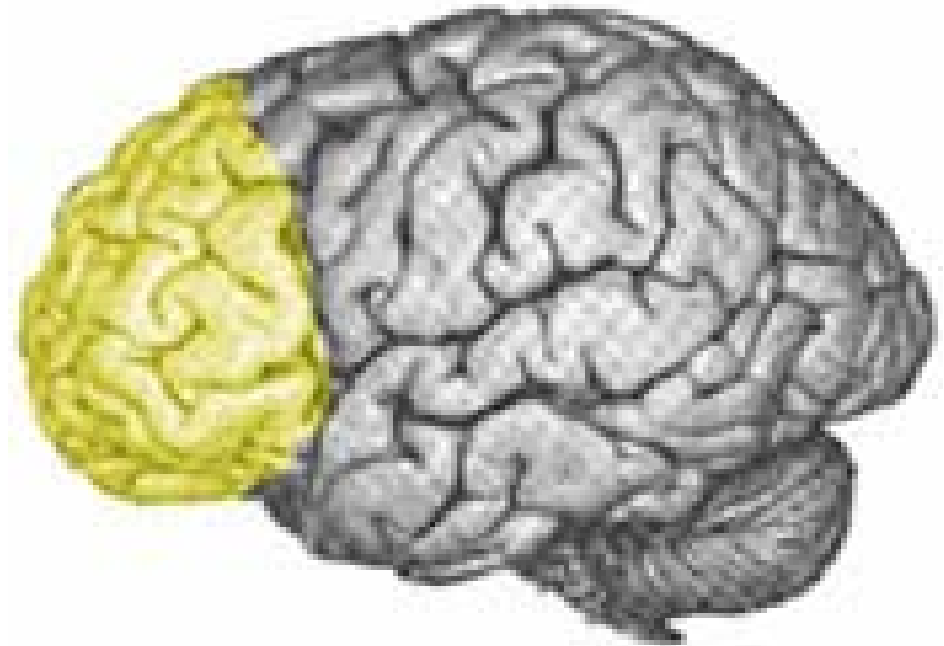
# Background

- Absorption in body contains information about hemoglobin level changes
- Thinking = BV level changes
- Biological tissue transparent 700-900 nm
- NIRS can predict certain thought processes



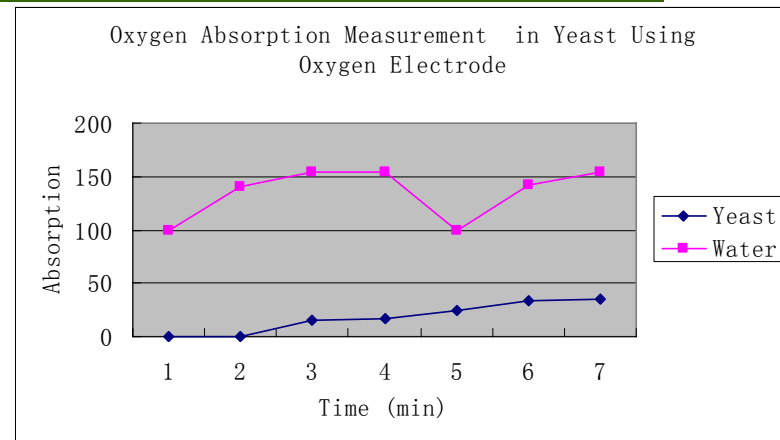
# Project Goals

- Different methods of quantitation
- NIRS and Cognosensor

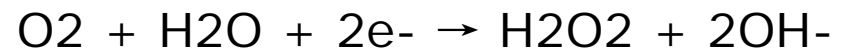


# Oxygen Absorption in Yeast

- Results of experiment performed with Clarke Oxygen Electrode, yeast, and water.

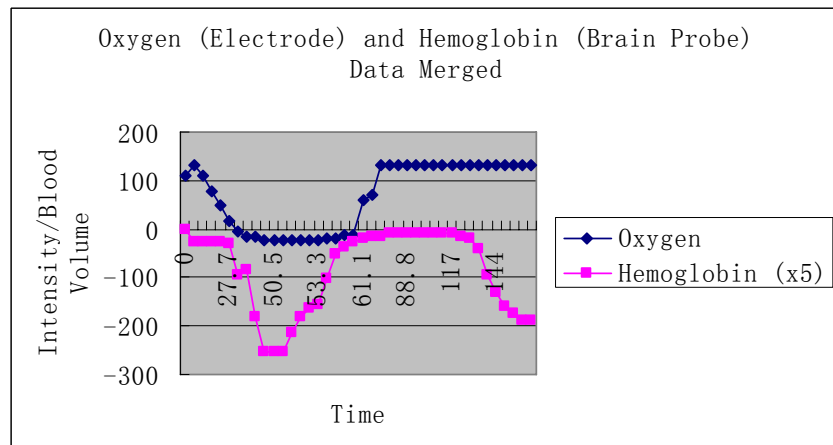
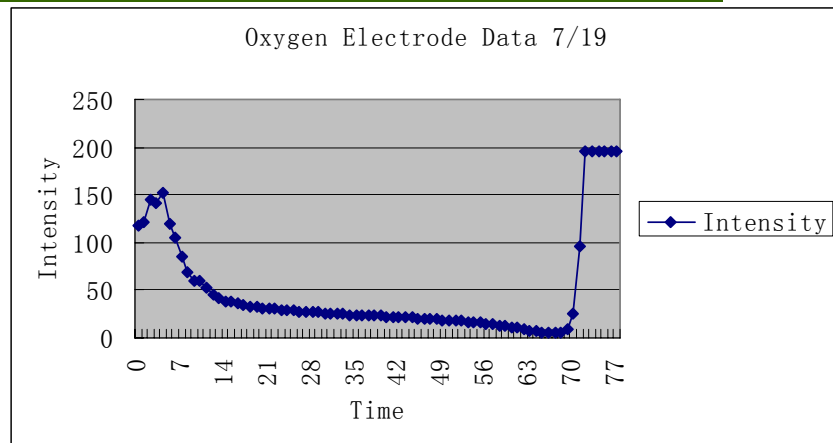


- Electrode used to connect with the non-metallic part of a circuit using equation



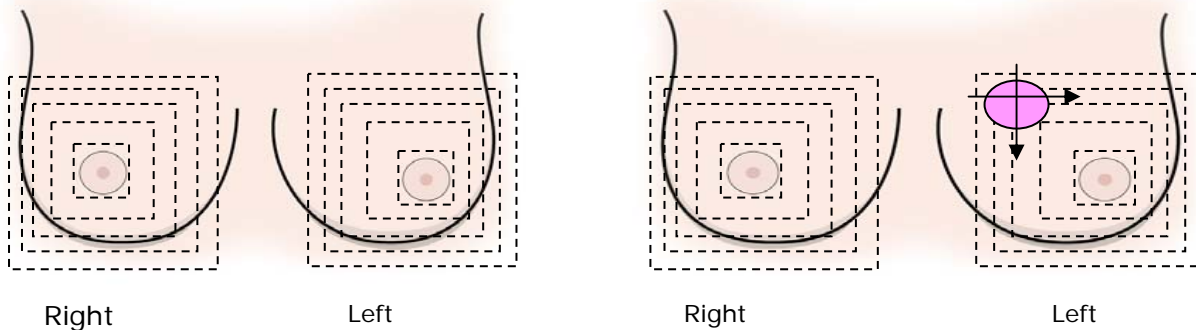
# Oxygen Absorption in Hemoglobin

- Results of oxygen absorption measurement in hemoglobin performed with Clarke Oxygen Electrode.



# Further Uses

- Early breast cancer detection
  - Women under 40
  - High risk
  - Underserved population



# Further Uses

- Lie detection
  - Many ground-breaking studies
  - Changes in blood oxygenation in cortex
  - Cognitive components of deception and emotional response
  - NIRS used to differentiate



# Conclusions

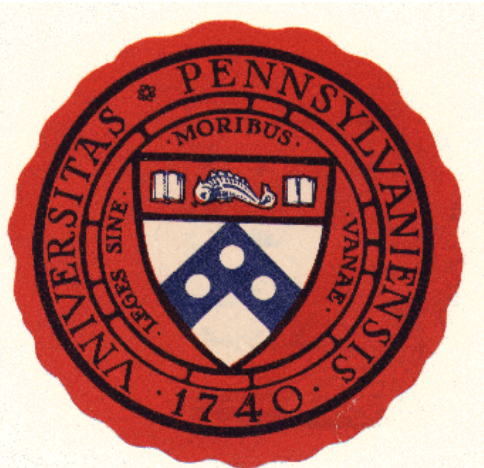
- Near Infra-Red Spectroscopy (NIRS) used to measure the change of blood volumes in the brain
- Simple and cheap handheld device used to non-invasively measure cognitive function
- Many uses including lie detection and early breast cancer detection

# Acknowledgements



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WHERE DISCOVERIES BEGIN

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**Thank You!**

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